

No. 880,189.

PATENTED FEB. 25, 1908.

C. BOURDON.  
MULTITUBULAR BOILER.  
APPLICATION FILED DEC. 9, 1905.

2 SHEETS—SHEET 1.

Fig. 3

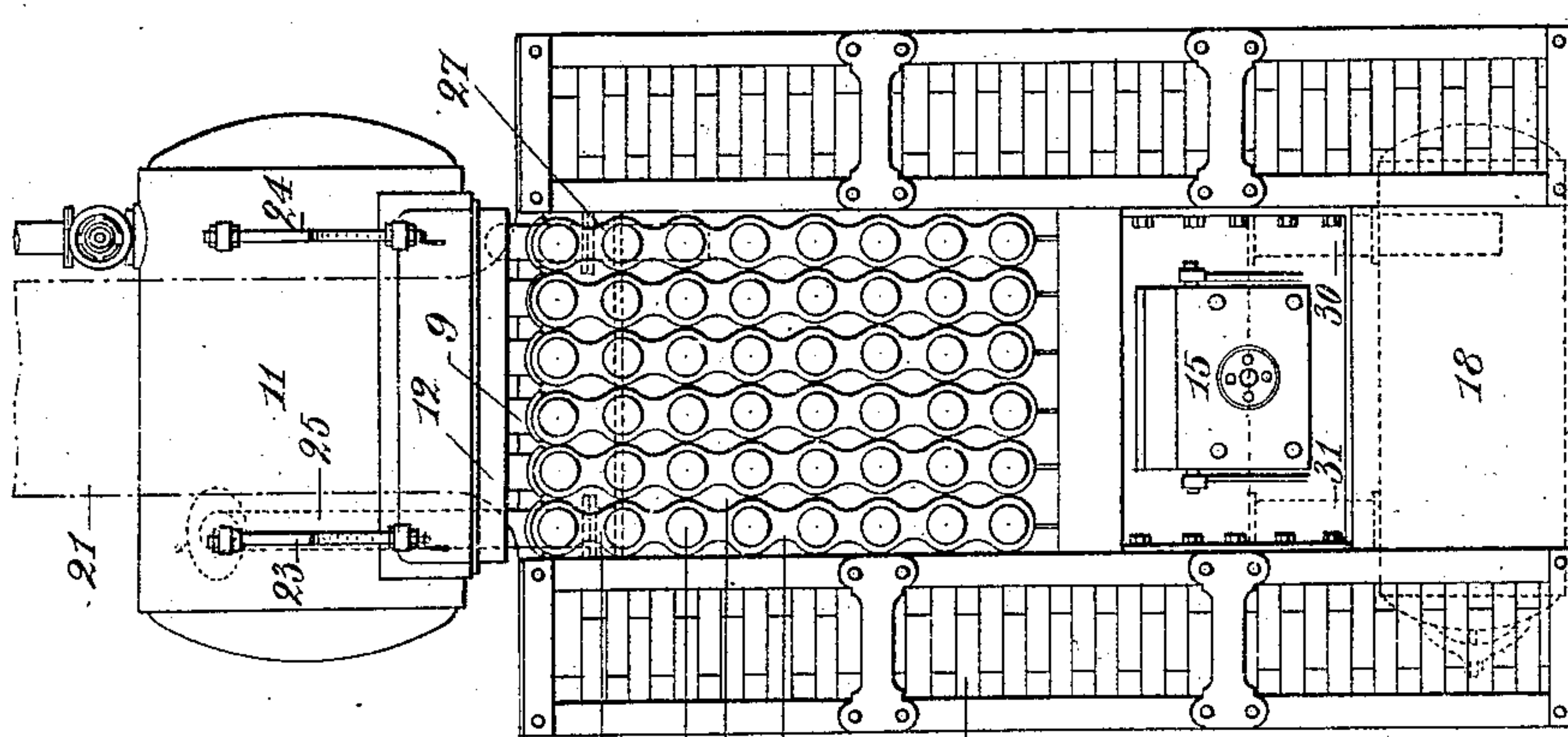


Fig. 2

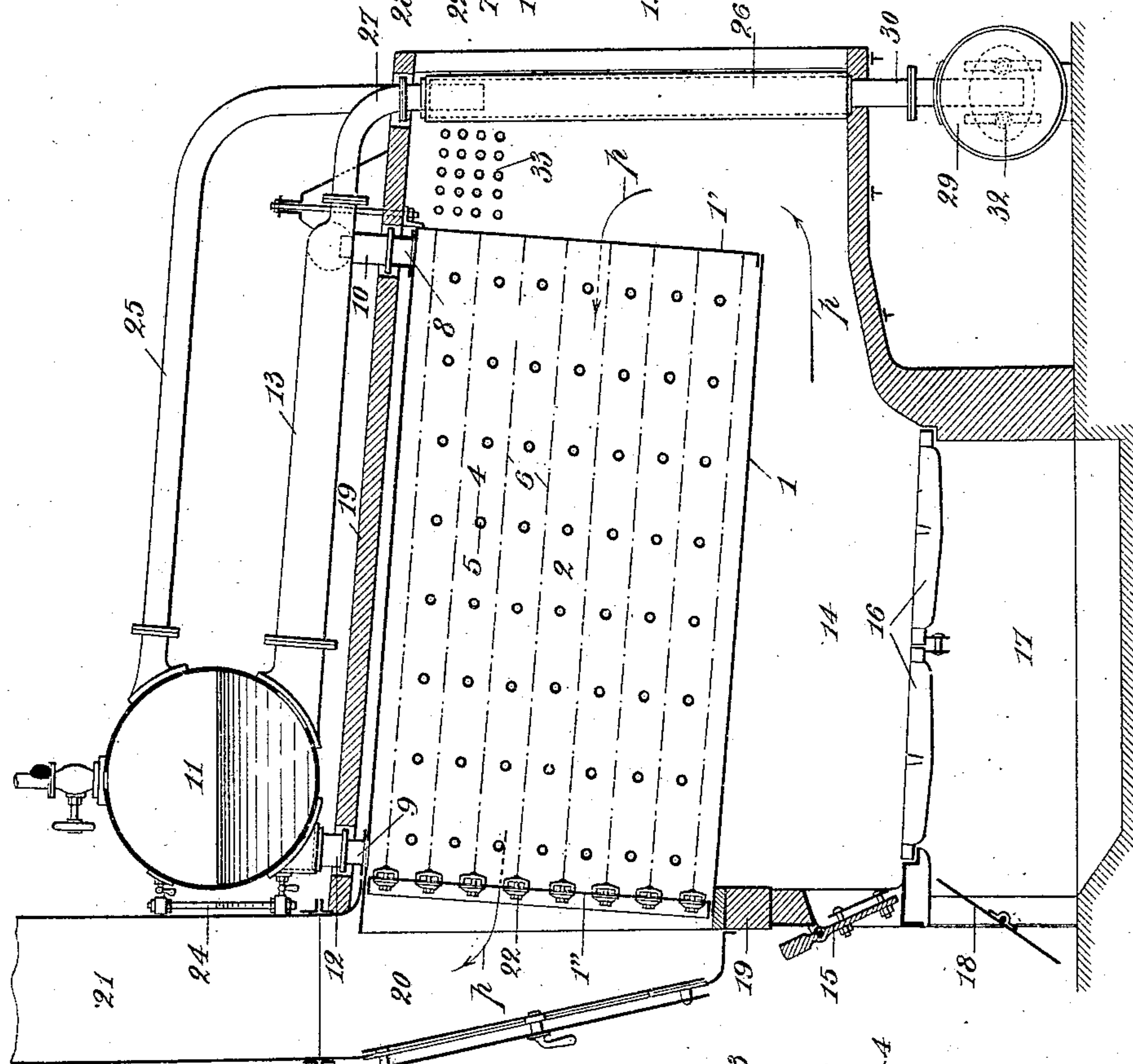
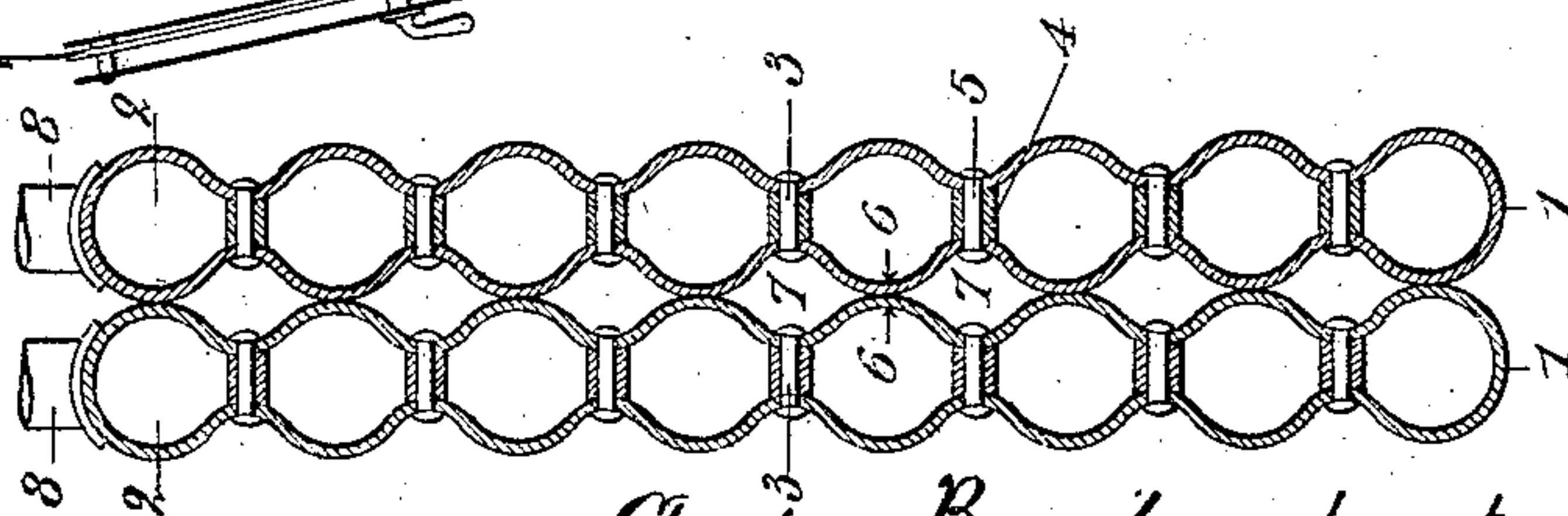


Fig. 1



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2 SHEETS—SHEET 2.

Fig. 4

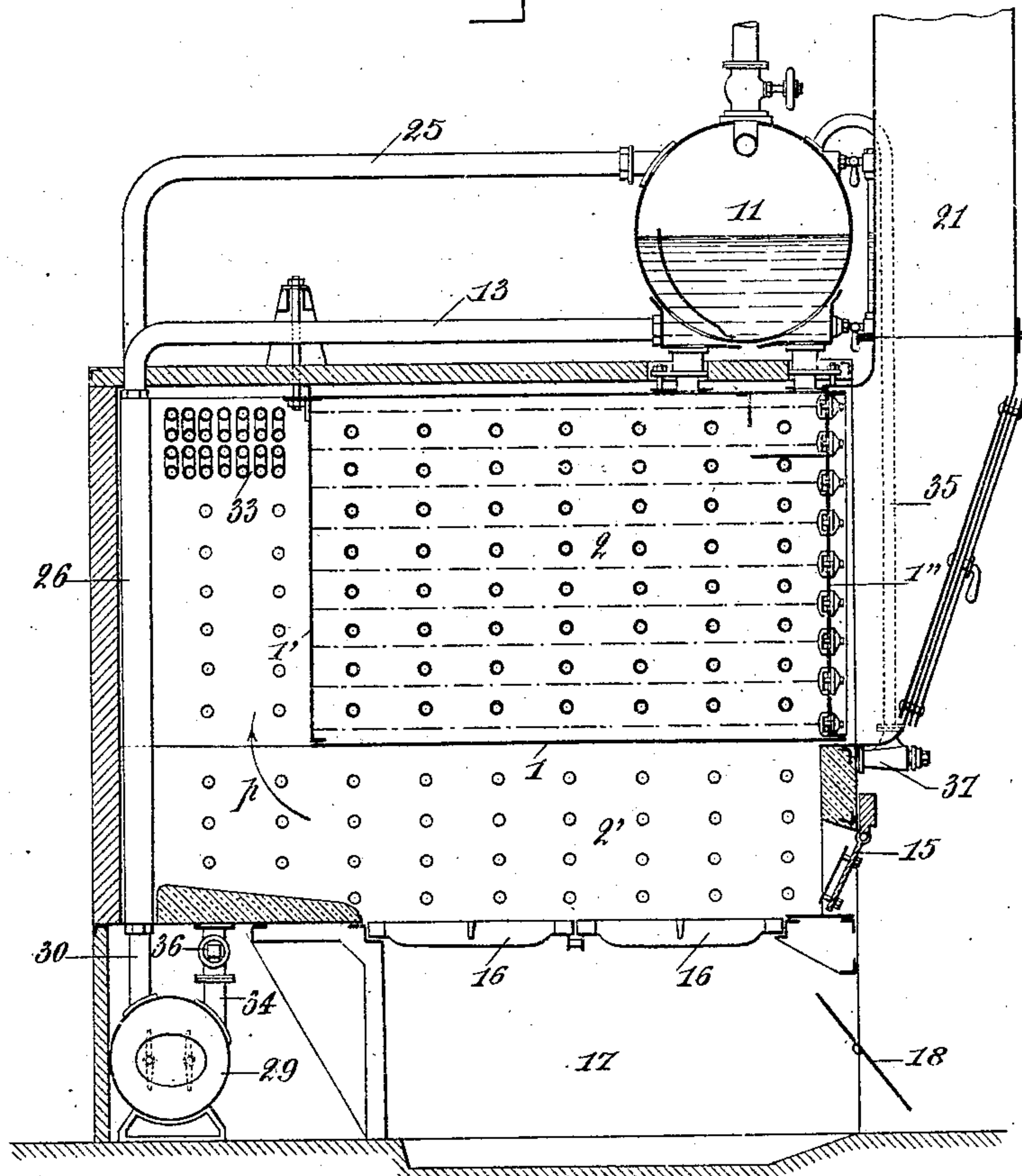
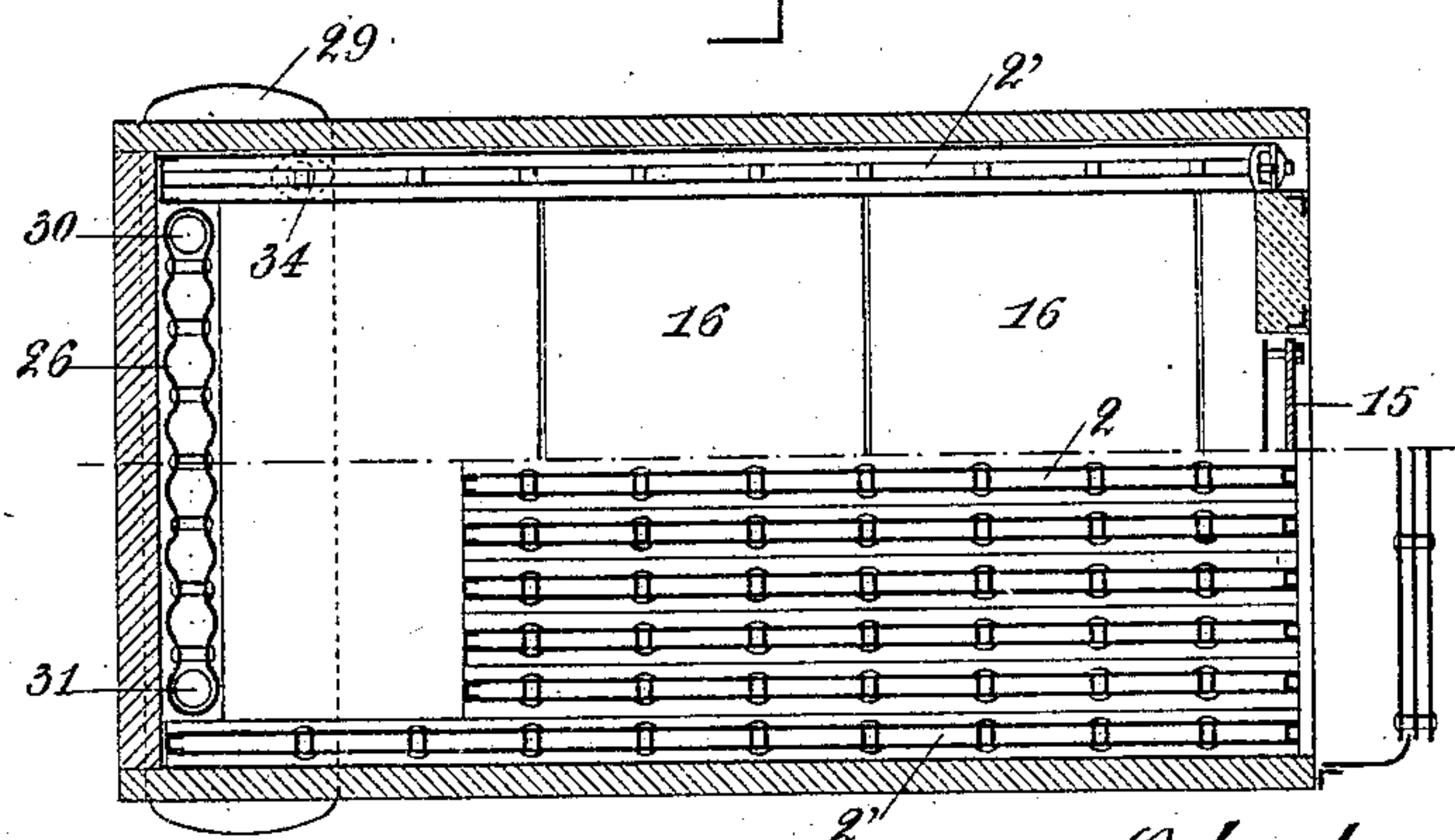


Fig. 5



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# UNITED STATES PATENT OFFICE.

CHARLES BOURDON, OF PARIS, FRANCE.

## MULTITUBULAR BOILER.

No. 880,189.

Specification of Letters Patent.

Patented Feb. 25, 1908.

Application filed December 9, 1905. Serial No. 291,060.

*To all whom it may concern:*

Be it known that I, CHARLES BOURDON, citizen of France, residing at Paris, France, have invented new and useful Improvements in Systems of Multitubular Boilers with Im-

movable Elements, (for which I have obtained a patent in France, No. 354,124, bearing date May 9, 1905, and Belgium, No. 184,595, May 18, 1905,) of which the following is a specification.

My invention has for its object a special construction of fire-tube boilers of the kind in which the water passages and the flues are formed by a series of elements consisting of corrugated plates, and consists in so arranging such elements that the corrugations are in contact along their whole length and are easily removable.

In the accompanying drawings, forming part of this application, I have illustrated one form of embodiment of my invention, in which drawings similar reference characters designate corresponding parts, and in which:

Figure 1 is a detail view in transverse section of two of the water elements; Fig. 2 is a longitudinal elevational section of a horizontal boiler constructed according to the invention; in Fig. 3 is shown a view in front elevation of the same boiler, the smoke stack being supposed to be removed. Fig. 4 is a longitudinal elevational sectional; and, Fig. 5 is a plan of a modified arrangement.

Each of the elements in question is formed by means of a waved sheet 1, folded upon itself as shown in Fig. 1 so as to form a kind of flattened box 2 which is provided with suitable water-tight end closures 1' and 1''. Upon each of the bottoms 3 of the descending curves there are arranged supporting devices such, for example, as the struts 4 and rivets 5 so as to give to the element the necessary resistance corresponding to the pressure which it has to support. By arranging a certain number of elements thus constructed one above the other, it becomes possible to form a tubular bundle in which the boxes 2 will be filled with water while by the coincidence of the concavities 3 and the convexities 6 there are obtained channels 7 similar to the tubes for hot gas of fire tube boilers, and in these channels freely pass the gases which proceed from the furnace to the chimney. It is therefore possible to obtain in this manner a true fire tube boiler

with immovable elements and the manner in which the boxes 2 are arranged the one with relation to the other will evidently enable us to form boilers of a certain type.

By way of example there are illustrated in Figs. 2 and 3 of the drawing an application of this system to a horizontal multitubular boiler. In this example the boxes or elements 2 are placed vertically one beside the other with a certain inclination in the direction of their length. Each element is provided upon its upper face with two tubes, the one 8 serving for the introduction of the water and arranged at the lowest point of the said face, the other 9 serving for the escape of the steam being placed at the highest point. The tubes 8 and 9 are respectively connected to the cylindrical chamber 11 which serves at the same time as a steam dome and has a water reservoir, by transverse collectors 10 and 12 communicating with the chamber 11, the first by means of the tube 13 opening into the lower part of the dome, and the other directly. The furnace 14 is closed in front by a suitable door 15 and comprises a grate 16, an ashbox 17 with its door 18, all of usual or convenient construction; finally the entire apparatus may be suitably mounted in masonry. The products of combustion follow the track indicated by the arrows *p* passing through the tubes 7 and arriving in the smoke box 20 from whence they escape through the chimney 21.

In the smoke box 20 each water tube can be cleaned and examined by means of an auto-clave plug 22 mounted upon the front part of the element. Gages 23, 24 enable the engineer to examine the variations of the level of the water in the reservoir 11, which level may moreover be maintained normally at the height of the center of the upper water tube 25. The bottom of the combustion chamber 14 may be protected by means of fire resisting bricks, but it is advantageous, seeing that this is subjected to the direct action of the flames to employ it as a heating surface, and to construct it in the form of a corrugated element 26 arranged vertically and connected to the tube 13 by a tube 27 and to the reservoir 11 at the tubes 28 and 25. It is also possible to arrange underneath the element 26 a cylindrical container 29 with which the element communicates so as to insure a circulation of water at a slow speed; this is done for instance by means of the two tubes 30, 31



of unequal lengths forming a kind of siphon. The receiver 29 then acts as a deposit chamber for scale, and the scale deposited may be removed through a suitable manhole 32. In the construction in which this arrangement is carried out, it is also advisable to supply the elements with water by means of pipes passing into the transverse branch of the collector of the feed 13 at a level near to the center of this latter, so as to facilitate the sinking of the solid deposits in the scale chamber.

If it is desired to have water walls around the furnace, in which case the boiler would become so to speak a boiler with internal furnace, it is easy to arrange an element such as the boxes 2, (Figs. 4, 5) on each side of the grate and the said elements may be supplied with water from behind by connections such as 34 with the scale chamber 29, while the steam produced will be sent into the dome 11 by means of tubes such as 35 fixed on their ends at the front of the boiler. Finally, the accompanying drawing shows that this type of boiler is very suitable for the installation of a superheater. This well known mechanism would be placed at 33 in the rear combustion chamber and would thus remain outside of the direct action of the fire but in a position where the temperature would be very suitable for obtaining an efficient superheating.

It is needless and even impossible to set forth in detail all the variations which might be adopted for the grouping of this system of elements according as it is desired to use them in the construction of a horizontal or of a vertical boiler.

These simple indications will serve to illus-

trate how numerous and diverse are the applications, which may be made of the new element of the generator constructed of corrugated boiler plate as above described.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a boiler, the combination of a plurality of movable elements, each element formed of a corrugated plate folded upon itself to provide a series of enlarged chambers for receiving the boiler water, and means for supporting the adjacent corrugated elements with the convex outer surfaces of their water chambers in contact for providing independent flues for the furnace gases between said several chambers, substantially as described.

2. In a boiler, the combination of a plurality of movable elements, each element formed of a corrugated plate folded upon itself to provide a series of enlarged chambers for receiving the boiler water, means for supporting the adjacent corrugated elements with the convex outer surfaces of their water chambers in contact for providing independent flues for the furnace gases between said several chambers, means for closing the ends of said several elements, and means for providing a circulation of feed water through said elements.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES BOURDON.

Witnesses:

JULES FAYOLLET,  
EUGÈNE PICHON.